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United States Department of Agriculture
Agricultural Research Administration
Bureau of Plant Industry, Soils,
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H.T.&S. Office Report No. 278

✓ The Shelf Life of Tangerines in Retail
Store Display Cases ✓

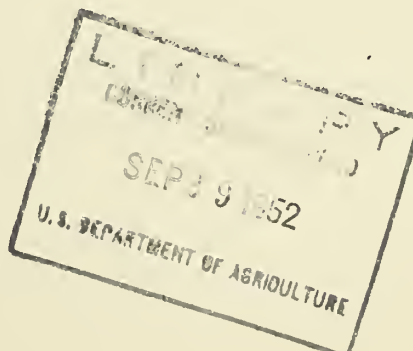
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Report of a study made under the
Research and Marketing Act of 1946
Project No. RM-52

August 1952
Beltsville, Maryland



THE SHELF LIFE OF TANGERINES IN RETAIL STORE DISPLAY CASES

Introduction

When tangerines are held in the retail store for several days, as is often necessary in the smaller stores, they may appear satisfactory in the display case but show considerable deterioration soon after purchase by the consumer. Whether or not the consumer will purchase tangerines undoubtedly depends largely upon such important factors as cost, appearance, waste, and flavor.

The purpose of this study was to determine the effects of retail store display and handling practices upon the quality and condition of tangerines, not only while in the hands of the retailer but also after a reasonable time in the hands of the consumer. It was conducted in a laboratory at Beltsville, Maryland, equipped with several types of display cases in which retail store conditions could be simulated. The tests were conducted during December, January, and February, 1952.

The tangerines were displayed for several days as follows:

1. Continuously in a non-refrigerated case.
2. In a non-refrigerated case during the daytime and stored in 32° and 40° F. "walk-in coolers" at night.
3. On a false bottom and regular rack in a mechanically refrigerated case (convection type).
4. In an ice bed case.

A 6-foot wood display case with galvanized metal bottom and sides was used for non-refrigerated display. It was provided with a slatted rack sloping towards the front. The distance from the front to the back of the case was 30 inches. The top front edge of the case was 10 inches above the bottom of the case and the back was 32 inches from the bottom. The top extended 13 inches from the back toward the front.

A 10-foot commercial, mechanically refrigerated display case (convection type) with mirror back was used for one type of refrigerated display. The distance from the front to the back of the case was approximately 3 feet. The regular rack provided with the case was 3 inches above the bottom at the front and 5 inches above at the back. The top front edge of the case was 9 inches above the rack. To simulate retail store display methods in which the produce is elevated on a false bottom, a rack was constructed of quarter inch mesh wire screen at a level about 7 inches above the regular rack.

A 5-foot insulated commercial ice bed case with mirror back, metal sides and sloping bottom was the third type of case used. It measured approximately 27 inches from the front to the back and was 11 inches deep at the front and 3 inches deep at the back.

The display cases were in a room on the ground floor of a well insulated brick building.

A 32° and a 40° F. storage room, were used for overnight storage of tangerines displayed in the non-refrigerated case. The temperatures in these rooms were thermostatically controlled, and small fans were used to provide air circulation. The relative humidity was kept at approximately 85 percent.

The difference between the original weight of the tangerines and the weight at the end of each testing period was recorded as "moisture" loss or gain although it is recognized that a minor part of the loss was caused by respiration.

Operation of the Display Room

All tangerines used in the tests were obtained in original containers from the Washington, D.C. wholesale fruit and vegetable market. They were hauled in a covered truck fifteen miles to the laboratory and immediately sorted into representative samples for the tests. Decayed and badly damaged tangerines were discarded. The tangerines were arranged on each rack 2 layers deep, from the front to the back of the rack.

The tangerines used in the mechanically refrigerated case and in the ice bed case were held in these cases night and day throughout the entire tests except for the time necessary each day to weigh and examine the specimens for changes that may have occurred during the previous 24-hour period. The tangerines in these cases were covered with heavy paper at night. Some tangerines that were not refrigerated at any time remained in the non-refrigerated case throughout the tests. They were not covered at night. Other lots of tangerines displayed in the non-refrigerated case during the daytime were stored at night in the "walk-in coolers" held at 32° or 40° F.

In each of the mechanically refrigerated and the non-refrigerated cases, one lot was sprinkled four times daily and a duplicate lot was not sprinkled at any time. However, the non-sprinkled tangerines that had been held overnight in the 32° and 40° F. rooms became wet from condensed moisture when they were returned to the non-refrigerated rack during each day of the tests.

In the ice bed case, the tangerines were arranged on a bed of crushed ice which had been spread over the bottom of the case 3 to 5 inches deep. The ice bed was replenished once each day. One lot of tangerines was covered with a thin layer of crushed ice each morning; and again at noon and mid-afternoon; two lots were garnished with ice only at night when the tangerines were prepared for night storage. Of the latter two lots, one was sprinkled and the other not sprinkled although the tangerines became wet from ice that melted

during the night. At six o'clock at night a thick layer of ice was spread over the tangerines in all lots in the ice bed case and they were then covered with heavy paper for the night.

The display period began between 8:00 A.M. and 9:00 A.M. when the tangerines were placed on the racks, and ended when they were prepared for night storage between 6:00 P.M. and 7:00 P.M.

The average daytime display room air temperatures during each of the testing periods were 74° to 75° F.

Fruit temperatures were obtained with thermocouples which were inserted into the tangerines at the same relative positions on each of the display racks.

Results

The principal defects that developed in tangerines under the various handling practices in retail store display cases were decay and severe drying of the skin adjacent to the stem end and loss of weight. (Figures 1, 2, 3.)

Temperatures as low as 32° F. were beneficial to the tangerines. Low temperatures not only retarded the development of decay but aided in prolonging their edible quality. Low temperatures and sprinkling with water several times daily were helpful in keeping the tangerines firm and free from decay and damage to the skin by drying. Practically all decay was green mold rot which started where the skin at the stem end had been injured by drying. Sufficient moisture was present in the fruit to allow rapid growth of green mold rot.

Under most handling practices, sprinkling caused no increase in the percentage of decay even in tangerines that had not been refrigerated at any time. Sprinkling with water or garnishing with ice materially reduced drying of the skin. The percentage of tangerines damaged by both severe drying of the skin and decay increased most rapidly in both sprinkled and non-sprinkled lots that had received no refrigeration, and in the non-sprinkled lot on the false bottom rack in the mechanically refrigerated case.

Temperatures of the tangerines displayed on the false bottom rack in the mechanically refrigerated case were 19 degrees higher than those on the regular rack, resulting in the development of considerably more decay on the false bottom than on the latter rack.

Decreases in weight due to moisture loss were greater in the tangerines that had not been sprinkled than in the sprinkled lots under each of the handling practices.

A panel of 10 members of the staff tasted the tangerines after they had been displayed in the various cases for 8 days. The tangerines of all lots were held at the same temperature for a sufficient time to equalize the temperatures of the different lots before they were tasted. The taste panel reported that the non-refrigerated tangerines had a "flat" taste whereas those that had been refrigerated had a more pleasing fresh taste.

Summary

The principal defects that developed during the study were decay, severe drying of the skin on the stem-end half of the fruit and loss of weight.

Low temperatures retarded the development of decay.

Wetting the tangerines several times daily materially reduced drying of the skin which permits entrance of decay organisms.

Weight losses were materially reduced by sprinkling with water or garnishing with ice.

Greater deterioration in quality was found in tangerines displayed on the false bottom rack than on the regular rack in the mechanically refrigerated case.

The natural flavor of tangerines was prolonged by low temperatures.

Suggestions for Prolonging the Shelf Life of Tangerines

Decay will be greatly reduced by use of low temperatures during the retail display period. Temperatures as low as 32° F. will not injure tangerines.

Natural flavor will be retained longer at low temperatures than at higher temperatures.

Drying of the skin will be reduced by sprinkling with water or garnishing with ice several times daily.

Overnight storage in iced produce barrels or in cold rooms is recommended if no equipment is available for daytime refrigeration.

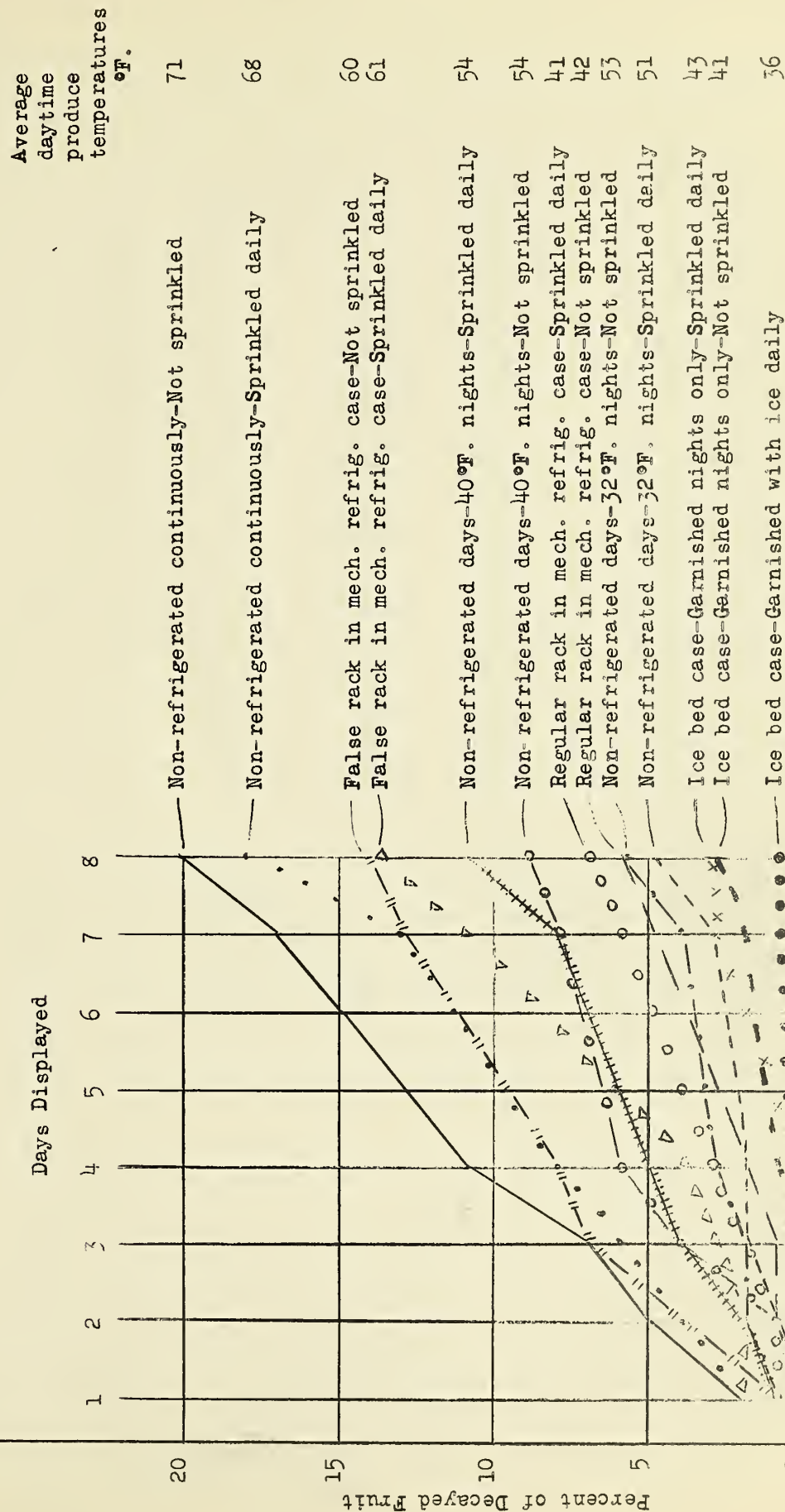


Fig. 2-Damage to Tangerines by Severe Skin Drying and Decay Under Various Handling Practices in Retail Store Display Cases

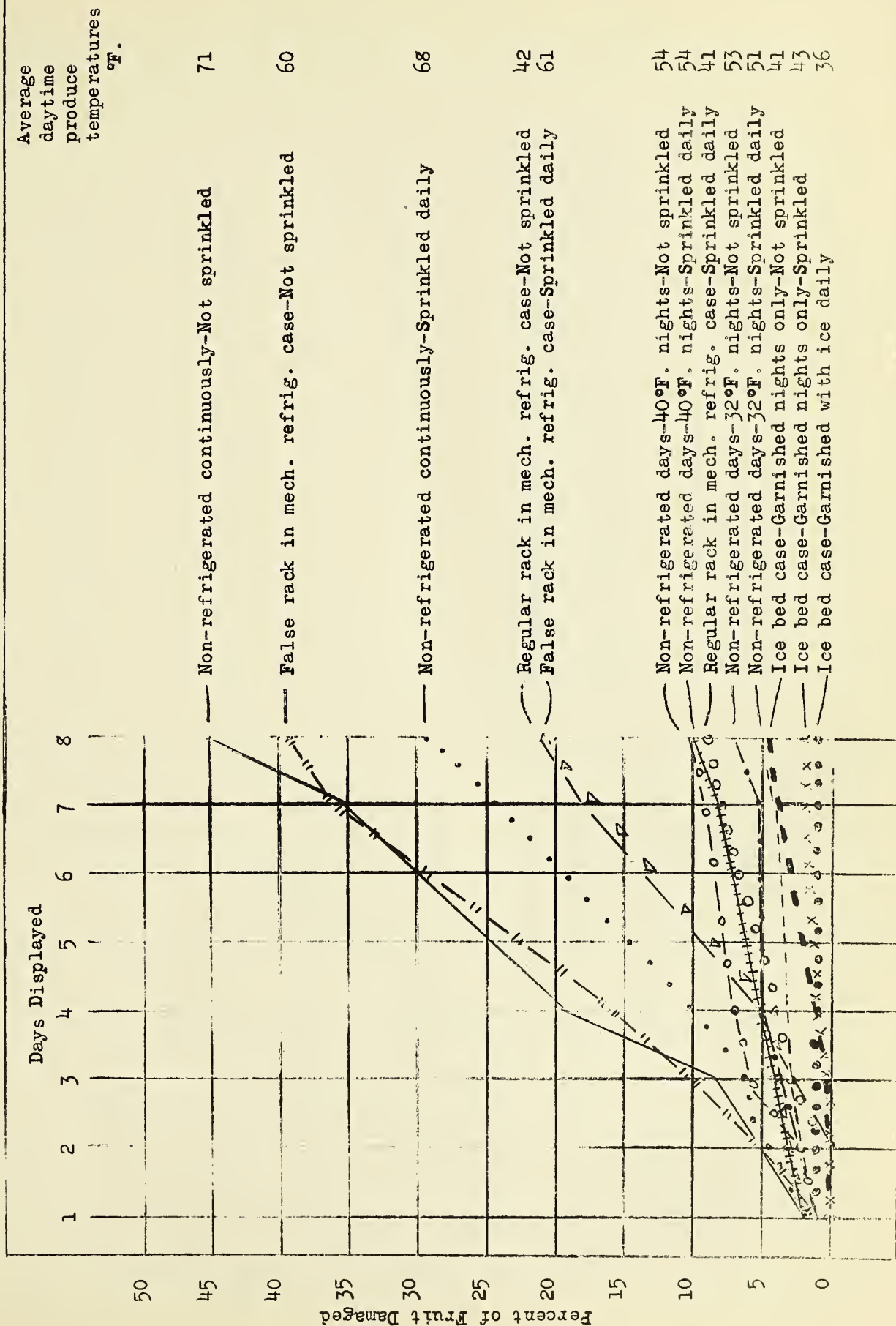


Fig. 3-Weight Changes in Tangerines as Affected by Various Handling Practices in Retail Store Display Cases

